

**UNITED STATES PATENT APPLICATION**

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## LIQUID CRYSTAL DISPLAY

This application claims the benefit of Korean Patent Application No. 2000-48433, filed on August 21, 2000, which is hereby incorporated by reference.

## **BACKGROUND OF THE INVENTION**

### **Field of the Invention**

The present invention relates to a liquid crystal display, and more particularly to a liquid crystal display that is capable of preventing optical sheets from being damaged and wrinkled by a panel guide.

### **Discussion of the Related Art**

Generally, as shown in FIG. 1 and FIG. 2, a liquid crystal module used as a display device in a notebook computer includes a main frame 14 received with a backlight assembly, a panel guide 12 attached to the upper portion of the main frame 14 in parallel, a liquid crystal panel 2 loaded onto the panel guide 12, a top case 16 for surrounding the edge of the liquid crystal panel 2 and the side of the main frame 14, and a bottom case 10 contacting the side of the top case 16 to surround the bottom of the liquid crystal module. As shown in FIG. 2, the backlight assembly includes a lamp housing 18 mounted with a lamp 20, a light guide 6 for converting a light inputted from the lamp 20 into a surface light source, and optical sheets 4 attached to the light guide to improve the efficiency of light incident to the liquid crystal panel 2. The optical sheets 4 consist of a plurality of stacked sheets such as a diffusion sheet, a prism sheet, a protective sheet and the like. The main frame 14 is usually made from a mold material, a metal or the like to fix and support the backlight assembly. The panel guide 12 is molded from a resin material such as polycarbonate, etc. and is attached to the upper portion of the main frame 14 to support the liquid crystal panel 2 from the lower

portion thereof. In this panel guide 12, a jaw or stepped prominence is provided at the upper surface of a panel loader loaded with a liquid crystal panel 2 so that the liquid crystal panel can be secured thereto. The sides of top case 16 and the bottom case 10 overlap one another and are fixed together by a screw. In the liquid crystal panel 2, a liquid crystal is injected  
5 between two sheets of glass substrates. A polarizer is attached to each sheet of glass substrate. The liquid crystal pixel cells are arranged in a matrix. Each liquid crystal pixel cell is driven with a thin film transistor (TFT). A tape carrier package (TCP) 22 mounted with drive integrated circuits (IC's) is provided between a signal line pad formed at the edge of the liquid crystal panel 2 and a printed circuit board (PCB) 8 installed under the main frame 14.  
10 A gasket 24 for shielding against electro-magnetic interference (EMI) is provided between the PCB 8 and the bottom case 10.

However, a gap of about  $0.4 \pm \alpha$  (for example  $0.4 \pm 0.1$  mm) exists between the panel guide 12 and the optical sheet 4. A thickness of the panel loader in the panel guide 12 is set to approximately 0.7 to 0.8 mm as shown in FIG. 3. This causes the problem that the panel guide 12 is pressed down by a load of the liquid crystal panel 2 itself or a pressure  
15 generated upon assembly, etc. to pressurize the optical sheet 4 in the conventional liquid crystal module. If the edge of the optical sheet 4 is pressed down by the panel guide 12, then the corresponding portion of the optical sheet 4 is wrinkled or damaged and results in a dark display portion on the picture display at the edge of the optical sheet 4. In the conventional  
20 liquid crystal module, also, the liquid crystal is deteriorated and the optical sheets 4 wrinkle due to heat that is generated in the lamp 20 and applied to the liquid crystal panel 2 through the gap between the panel guide 12 and the backlight assembly. Furthermore, the conventional liquid crystal module has a problem in that a short between the pads or the

patterns is generated by a foreign substance flowing into the liquid crystal panel 2, the PCB 8 and the TCP 22 via the gap upon change of the backlight assembly or in an assembly process of the liquid crystal module.

## **SUMMARY OF THE INVENTION**

Accordingly, the present invention is directed to a liquid crystal display that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a liquid crystal display that is capable of preventing optical sheets from being damaged or wrinkled by a panel guide.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a liquid crystal display device according to the present invention includes a liquid crystal panel; a backlight assembly for radiating light onto the liquid crystal panel; a panel guide provided between the backlight assembly and the liquid crystal panel to support the liquid crystal panel; and a pad or insulator provided between the panel guide and the backlight assembly to maintain a constant distance between the panel guide and the backlight assembly and to shut off heat and to prevent a foreign substance from flowing into the liquid crystal panel.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

**BRIEF DESCRIPTION OF THE DRAWING**

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

FIG. 1 is a plan view showing a structure of a conventional liquid crystal module;

FIG. 2 is a section view of the liquid crystal module taken along the A-A' line in FIG. 1;

FIG. 3 is a section view representing a state in which the guide panel in FIG. 2 has been pressed down;

FIG. 4 is a plan view showing a structure of a liquid crystal module according to an embodiment of the present invention; and

FIG. 5 is a section view of the liquid crystal module taken along the B-B' line in FIG. 4.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Reference will now be made in detail to the preferred embodiment of the present invention, example of which is illustrated in the accompanying drawings.

Referring to FIG. 4 and FIG. 5, there is shown a liquid crystal display (LCD)

5 according to a first embodiment of the present invention. The LCD includes a first silicon pad 54 provided between a backlight assembly and a panel guide 42, a second silicon pad 56A provided between a main frame 44 and a printed circuit board (PCB) 38, and a third silicon pad 56B provided between the PCB 38 and the bottom case 40. The backlight assembly has a lamp 50, a lamp housing 48, a light guide 36 and optical sheets 34, and is received within the  
10 main frame 44 to be secured by the main frame 44. The first silicon pad 54 is substantially made from an elastic silicon, and is provided between the light guide 36 and the panel guide 42 to support the panel guide 42. The first silicon pad 54 maintains a constant gap between the optical sheet 34 and the panel guide 42. Also, the first silicon pad 54 shuts off heat generated from the lamp 50 and prevents heat flow into the liquid crystal panel 32 and the  
15 optical sheets 34. The first silicon pad 54 also prevents any foreign substance from flowing into the liquid crystal panel. The second silicon pad 56A maintains a distance between the main frame 44 and the PCB 38, while the third silicon pad 56B maintains a distance between the PCB 38 and the bottom case 40. The first, second and third silicon pads 54, 56A and 56B are installed to surround the liquid crystal module in a shape of square stripe. These silicon  
20 pads 54, 56A and 56B may be formed entirely of resin or by a coating of the resins.

The panel guide 42 is attached to the upper portion of the main frame 44, and a hole allowing the first silicon pad 54 to be secured to the bottom surface of that upper portion is provided. Sides of a top case 46 and a bottom case 40 overlap each other to be secured to

each other by a screw (not shown). A tape carrier package (TCP) 52 is attached between the pad part formed at the edge of the liquid crystal panel 32 and the output pad of the PCB 38 by an anisotropic conductive film (ACF). A gasket for shielding against EMI may be installed between the PCB 38 and the bottom case 40.

5           As described above, the liquid crystal display according to the present invention has the silicon pad 54 provided between the panel guide 42 and the backlight assembly. By the silicon pad 54, the present liquid crystal display is capable of preventing the panel guide from being pressed down and shields heat inputted from the lamp 20 or a foreign substance, thus minimizing damage and wrinkling of the optical sheets 34. Furthermore, the present liquid crystal display provides the silicon pads between the main frame 44 and the 10 PCB 38 and between the PCB 38 and the bottom case 40 to maintain the distances between the main frame 44 and the PCB 38 and between the PCB 38 and the bottom case 40 and prevents any foreign substance from flowing into the TCP 52 and the liquid crystal panel 32, thereby preventing a short between the TCP 52 and the pads formed on the liquid crystal 15 panel 32.

          It will be apparent to those skilled in the art that various modifications and variation can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and 20 their equivalents.